

# Work Order ID 54716

December 16, 2009 3:29:17 PM



Page 1

Item ID: D3898-1

Accept



Setup Start



Revision ID:

Stop



Item Name: Floor Protector (206L)

Start Date: 16/12/2009 Start Qty: 4.00



Cust Item ID:

Required Date: 18/12/2009 Req'd Qty: 4.00



Customer:

Reference:

Approvals:

Process Plan:

Date:

09/12/16

Tooling:

Date:

Run Start



QC:

Date:

SPC (Y/N):

Date:

Stop



Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Draw  
Number

Draw  
Rev.

Plan  
Code

Accept  
Qty

Reject  
Qty

Reject  
Number

Insp.  
Stamp

Draw Nbr

Revision Nbr

D3898

Rev A

100

0.00



HandThermo

Memo

0.00

Hand Finishing Thermoforming

1-Cut Sheet to required Blank size

OK 10/01/05 (x4)

110

0.00



Thermoform

Memo

0.00

Thermoforming Machine

1-Machine Set-Up  
2-Pre-heat Tool to required temp.  
3-Thermoform as per Dwg and Folio #FTA0xxusing tool DT9501  
Dwg Rev: A  
Folio Rev: B

OK 10/01/19 (x4)

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Work Order ID 54716

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Item ID: D3898-1

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Item Name: Floor Protector (206L)

Start Date: 16/12/2009 Start Qty: 4.00



Required Date: 18/12/2009 Req'd Qty: 4.00



Cust Item ID:

Customer:

Reference:

Run Start



Approvals:

Process Plan:

Date:

Tooling:

Date:

Stop



QC:

Date:

SPC (Y/N):

Date:

Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Draw  
Number

Draw  
Rev.

Plan  
Code

Accept  
Qty

Reject  
Qty

Reject  
Number

Insp.  
Stamp

120

QC2- Inspect parts off machine FAI/FAIB

0.00



QC

Memo

0.00

Quality Control

Visually inspect part for proper formation and texture

OK 10/01/19 (x4)

130

QC8- Inspect parts - second check

0.00



QC

Memo

0.00

Quality Control

OK 10/01/19 (x4)

140

0.00



HandThermo

Memo

0.00

Hand Finishing Thermoforming

1-Trim to finished dimensions as per Dwg

OK 10/01/19 (x4)

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Work Order ID 54716

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Page 3

Item ID: D3898-1

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Setup Start



Revision ID:

Stop



Item Name: Floor Protector (206L)

Start Date: 16/12/2009 Start Qty: 4.00



Cust Item ID:

Required Date: 18/12/2009 Req'd Qty: 4.00



Customer:

Reference:

Run Start



Approvals:

Process Plan:

Date:

Tooling:

Date:

Stop



QC:

Date:

SPC (Y/N):

Date:

Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Draw  
Number

Draw  
Rev.

Plan  
Code

Accept  
Qty

Reject  
Qty

Reject  
Number

Insp.  
Stamp

150

QC2- Inspect parts off machine FAI/FAIB

0.00



QC

Memo

0.00

Quality Control

Complete FAI document

OK 10/01/19 (X3)  
PTD →

160

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

Quality Control

5 10/03/04

(X3) (X0)

170

Identify as per dwg & Stock Location: \_\_\_\_\_

0.00



Packaging

Memo

0.00

Packaging

PPD  
53986

6/10/3/5 (3)

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D3898-1 PAR #: \_\_\_\_\_ Fault Category: Thermoforming NCR: Yes No DQA: \_\_\_\_\_ Date: 10/03/16  
 Resolution: <sup>(1)</sup> Scrap / <sup>(2)</sup> Accepted Disposition: <sup>(1)</sup> Scrap / <sup>(2)</sup> Use as is. QA: N/C Closed: \_\_\_\_\_ Date: 10/03/16

NCR: <u>54716</u>		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
(1) 10/01/04	150	Scrap 1 part (too thin) 2.1. <del>over</del> machine malfunction	CP 10.03.04 PW 451042	Modify mould to enlarge radii on inside tunnel } see PAR no replace } 09-037	Wh 10/03/04	S 10/03/04	CP 10.03.04 PW 451042	S 10/03/04
(2) 10.03.04	150	MIN THICKNESS = 0.068" IN AREA MARKED 0.080"	CP 10.03.04 PW 451042	Acceptable based on DS EMAIL.	Wh 10/03/04	S 10/03/04	CP 10.03.04 PW 451042	S 10/03/04

NOTE: Date & initial all entries

# Work Order ID 54716

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Item ID: D3898-1

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Stop

Item Name: Floor Protector (206L)

Start Date: 16/12/2009 Start Qty: 4.00

Cust Item ID:

Required Date: 18/12/2009 Req'd Qty: 4.00

Customer:

Reference:

Run Start

Approvals:

Process Plan:

Date:

Tooling:

Date:

Stop

QC:

Date:

SPC (Y/N):

Date:

Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Draw  
Number

Draw  
Rev.

Plan  
Code

Accept  
Qty

Reject  
Qty

Reject  
Number

Insp.  
Stamp

180

QC21- Final Inspection - Work Order Release

0.00

QC

Memo

0.00

Quality Control

10/03/11 HJ

mf  
10-3-05

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



# Picklist Print

December 16, 2009 3:29:21 PM

Page 1

Work Order ID: 54716

Parent Item: D3898-1

Parent Item Name: Floor Protector (206L)

Start Date: 16/12/2009

Required Date: 18/12/2009

Comments:

Start Qty: 4.00

Required Qty: 4.00

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Remaining Qty To Pick	Qty Issued	Date Issued	Status
---------------------------------	------------------------	---------------	-------------	---------------------	------------------	-----------------	--------------------	----------------	--------------------------	---------------	----------------	--------

MLEXS.118-90318-08		Purchased	No			100	sf	2,818.330	42.4000			
--------------------	--	-----------	----	--	--	-----	----	-----------	---------	--	--	--



Lexan Sheet

Warehouse

Loc Qty

Loc Code

Location

Main Warehouse

MAT

2818.33

111588

98.33

113127

2720

4 x 10.634 =

42.5 sq. ft.

Ok. 10/01/11

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

DART AEROSPACE LTD		Work Order:	54716
Description: Floor Protector		Part Number:	D3898-1
Inspection Dwg: D3898	Rev: A	Page 1 of 1	

### FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☐ Prototype

#### THERMOFORMING SECTION

Description	Accept	Reject	Method of Inspection	Comments
Inside Radii less than "	✓			
Shape Definition	✓			
Texture Retention	✓			
Material imperfections such as bumps, cracks, voids, scratching	✓			

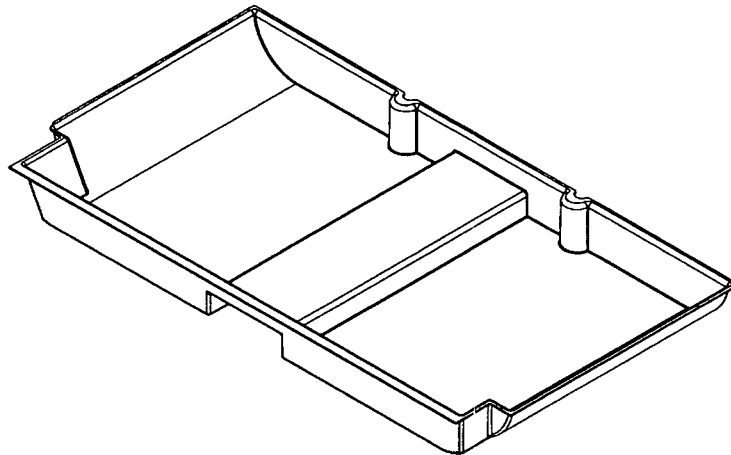
Measured by:	<i>Whe</i>	Date:	10/01/19
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#### TRIMMING SECTION

Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
0.50	Min	0.598"	✓			
1.00	Min	1.086"	✓			
5.6	+0.2/-0.0	5.60	✓			
0.080	Min	0.068		✓	See Attached Email + NCR	
0.050	Min	0.069	✓			

Measured by:	<i>Whe</i>	Date:	10/01/19
Audited by:	<i>JB</i>	Date:	10/01/19
Prototype Approval:	N/A	Date:	N/A

Rev	Date	Change	Revised by	Approved
A	09.09.15	New Issue	KJ	<i>Whe</i>



**D3898-1 FLOOR PROTECTOR (206L)**

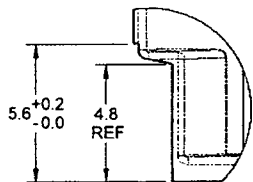
SHOP COPY  
 RETURN TO  
 ENGINEERING  
 UNCONTROLLED COPY  
 SUBJECT TO AMENDMENT  
 WITHOUT NOTICE  
 WORK ORDER  
 NO. 34714  
09-12-16

**RELEASED**  
09/05/08

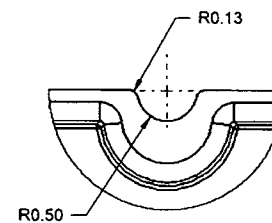
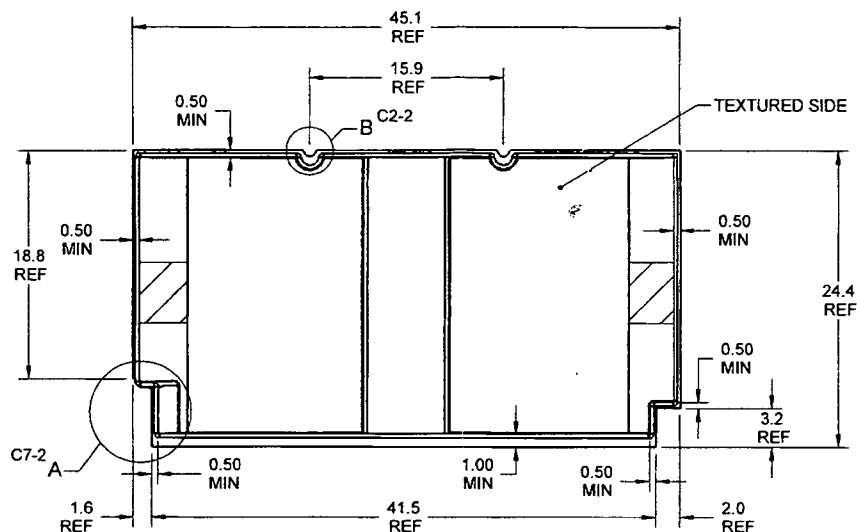
**NOTES:**

- 1) MATERIAL: LEXAN 90318 (PROTECT-A-GLAZE), 0.118 THICK, 112-CLEAR (MLEXS.118-90318-08)
- 2) FINISH: NONE
- 3) TOLERANCES: PER DART QSI 018 UNLESS OTHERWISE NOTED
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX
- 6) IDENTIFICATION: IDENTIFY WITH DART P/N "D3898-1" USING VIBRATING STYLUS
- 7) WEIGHT: 5.0 lbs
- 8) TOOLING: THERMOFORM PER MOLD DT9501 PER DART QSI 022. TRIM PER MOLD
- 9) MINIMUM THICKNESS: 0.050" EXCEPT AS SHOWN

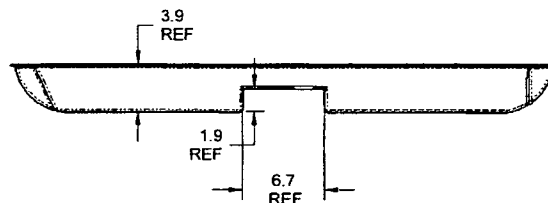
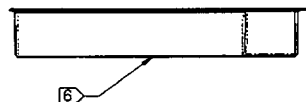
A		NEWISSUE		PH	09.02.27
REV.	DESCRIPTION			BY	DATE
DESIGN	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA				
DRAWN					
CHECKED	DRAWING NO.			REV. A	
MFG. APPR.	D3898				SHEET 1 OF 2
APPROVED	TITLE				SCALE
DE APPR.	FLOOR PROTECTOR (206L)				NTS
DATE	09.02.27			COPYRIGHT © 2008 BY DART AEROSPACE LTD <small>THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	



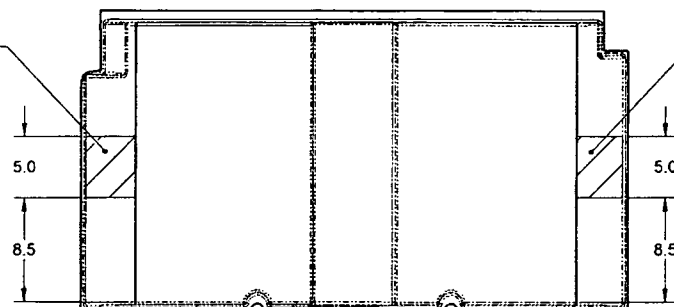
**DETAIL A** C6-2  
SCALE 2X



**DETAIL B** D5-2  
SCALE 5X  
2 PL



MIN THICKNESS  
0.080  
(SHADED REGION)



MIN THICKNESS  
0.080  
(SHADED REGION)

**D3898-1 FLOOR PROTECTOR (206L)**

**RELEASED**  
09/06/08

w/0 54716

DESIGN	PH	<b>DART AEROSPACE LTD</b>	
DRAWN	PH	HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. A
MFG. APPR.		D3898	SHEET 2 OF 2
APPROVED		TITLE	SCALE
DE APPR.		<b>FLOOR PROTECTOR (206L)</b>	
DATE	09.02.27	NT	
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**Chris Provencal**

---

**From:** David Shepherd [dshepherd@dartaero.com]  
**Sent:** February 11, 2010 12:39 PM  
**To:** 'Daryl Leger'  
**Cc:** 'Mike Petsche'; cprovencal@dartaero.com; 'Bill Beckett'  
**Subject:** RE: 206-407 Clear polycarbonate floor protectors.

Daryl,

I find this really frustrating. I don't totally buy what your selling. Seems to me we've been having these sorts of problems since we started thermoforming on almost every part we make. I thought we'd been drying our polycarbonate for a couple of years already ... didn't think we just started doing this. The 206/407 floor protectors were tested this summer, so the material should have been dried out before we made the test articles. Why would we follow a different process for prototype parts than production parts, especially when we know that thickness is critical to my acceptance of the part???

I think a lot of the problems stem from the environmental variation. In the summer, its often 40 degrees with high humidity while in the winter, building temperature at the back door is probably down around 15 degrees and the humidity is a lot lower. The floor protectors were tested in the summer and you're doing a production run in the winter. I also know you've rotated the machine since the summer, so this might be a factor.

If drying out the material gives the most consistent results, then I suggest we overdry the test articles so that we get the minimum thickness possible when we test. Also suggest we try to pull all test parts on cool, non-humid days.

Anyways ... enough ranting and raving. To me, the allowable thickness on the forward floor protectors is irrelevant to the rear floor protectors. The loads are based on weight and size of the part, so the loads are considerably higher on the rear floor protectors. What is relevant is the loads that were required and how much load we actually applied during the test.

Per TR-D407-781-5, we were required to pull 20 lb UP, 80 lb FWD, 40 lb SIDE, and 7.5 lb REAR and we actually applied 35 lb UP, 140 lb FWD, 66 lb SIDE, and 30 lb REAR. Bearing/shear stress near the fasteners will be 1:1 dependant on thickness (as opposed to the middle of the part which is in bending). Therefore we have a minimum margin of 65% based on the side loading.

You are requesting a 20% reduction in thickness. Therefore, the parts are acceptable to me

If you are seeing decreased thicknesses in other parts that puts them below the minimums on the drawings, I hope you are properly reporting this through the right channels and having the deviations approved by Engineering. Personally, I haven't seen anything. If the thicknesses are low on the aft facing seat pans, I can almost guarantee you that we will be re-testing since we don't have the same margins. This is expensive ... and I believe we have already re-tested once before for you for thickness problems.

Chris,

Please update the minimum thickness near the attachment points to be 0.065" (fuck it ... give him 0.060" to be safe) per Daryl's request on D3875-1, D3898-1 (there is no -2), and D3940-1. The design review should include a rationale similar to the one I have presented above, except that you can eliminate the ranting and raving.

David

---

**From:** Daryl Leger [mailto:dleger@dartaero.com]

2010-03-04

**Sent:** Tuesday, February 02, 2010 2:25 PM  
**To:** David Shepherd  
**Cc:** Mike Petsche; cprovencal@dartaero.com  
**Subject:** 206-407 Clear polycarbonate floor protectors.

David

As per our conversation last Friday,  
I would like to request that a minimum thickness requirement be changed on the drawings for the rear floor protectors, models 206 and 407.

The reason is that now we are drying our polycarbonate prior to thermoforming. This drying, evaporates any moisture content in the sheet and eliminates air that can get trapped in the sheet while thermoforming. Trapped air in the sheet can cause unsightly blistering in the sheet and also causes the sheet to expand in thickness because of the air trapped in the sheet. (Remember the expanding polycarbonate rear-facing seats)

We can now thermoform a more uniform part and in our opinion, a much better product because of the uniform material distribution and the clarity of the finished product. The only drawback is that we have difficulty in meeting thickness requirements in some areas. The original test parts were made prior to us understanding the necessity of sheet drying and the material thickness in those test parts, was not near as uniform..

**The pilot and co-pilot ( D3874-1/2) floor protectors call for a minimum thickness of 0.050 at the area of the attachment points, which is not an issue.**  
**The rear floor protectors (D3875-1, D3898-2 and D3940-1) however call for a minimum thickness of 0.080 at the area of the attachment points.** A minimum thickness of 0.050" is called for over the main body for the rest of the rear floor protectors. This is where we are running into a problem.

The recent floor protectors we vacuum formed, have a pretty constant thickness of 0.068" - 0.070" throughout the whole part including the attachment area.

Is it possible to revise the drawings to decrease the thickness requirement of the rear floor protectors at the attachment area to 0.065" without having to re-test.  
Based on the argument that the forward protectors only have a thickness requirement of 0.050" at the attachment point, I hope this would be acceptable

PS. This problem is not unique to this product, we are also seeing decreased thicknesses in the aft-facing seats, R44 floor protectors and expect to see it in all the other polycarbonate products we haven't made in a while

RSVP

*Daryl L. Leger*  
Production Engineering Co-ordinator

**DART**

**aerospace**

TEL: 613-632-5200

FAX: 613-632-1426

EMAIL: [dleger@dartaero.com](mailto:dleger@dartaero.com)

No virus found in this incoming message.

Checked by AVG - [www.avg.com](http://www.avg.com)

Version: 8.5.435 / Virus Database: 271.1.1/2663 - Release Date: 02/02/10 07:35:00

2010-03-04